METHOD FOR CONSTRUCTING COMPOSITE RESPONSE SURFACES BY COMBINING NEURAL NETWORKS WITH POLYNOMIAL INTERPOLATION OR ESTIMATION TECHNIQUES

Cross Reference To Related Applications:

No. 6,606,612

5   This application claims the benefit of U. S. Patent Applications No.
09/374,491, filed August 13, 1999 and entitled "Method For Constructing
Composite Response Surfaces By Combining Neural Networks With Other
Interpolation Or Estimation Techniques," which is incorporated by reference herein.

Origin of the Invention:

10   The invention described herein was made by employees of the United States
Government and may be manufactured and used by or for the Government for
governmental purposes without the payment of any royalties thereon or therefor.

Technical Field:

The present invention is a method for constructing composite response
15   surfaces by combining neural networks with polynomial interpolation or estimation
techniques. These composite response surfaces can be used in a variety of
applications. In particular, such surfaces are very useful in aerodynamic design
optimization which has several attributes that render it a difficult problem to solve.

Description of the Related Art:

20   The design of aerodynamic components of aircraft, such as wings or engines,
involves a process of obtaining the most optimal component shape that can deliver
the desired level of component performance, subject to various constraints, e.g., total
weight or cost, that the component must satisfy. Aerodynamic design can thus be
formulated as an optimization problem that involves the minimization of an
25   objective function over the design space, subject to constraints. A variety of formal
optimization methods have been developed in the past and applied to aerodynamic
design. These include inverse design methods, adjoint methods, sensitivity derivative-
based methods, and traditional response surface methodology (RSM).